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## CAIMANOIDEA VISHERI, A NEW CROCODILIAN FROM THE OLIGOCENE OF SOUTH DAKOTA

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In the summer of 1911, Mr. S. S. Visher, then connected with the Geological Survey of South Dakota, collected some interesting crocodilian material from the Oligocene of Washington County, South Dakota. Some time ago, the attention of the writer was called to these remains by Dr. Visher, and recently through the courtesy of Mr. W. H. Over, director of the museum at the University of South Dakota, the collection was loaned to the writer for study.

The material herein described consists of a goodly portion of a skull, a nearly complete mandible, two femora and other limb bones, a nearly complete series of vertebrae, many dorsal scutes, and numerous fragments. According to Dr. Visher, the collection was made from the Titanotheres zone of the Lower White River beds, perhaps 20 to 30 feet above their base.

### THE SKULL

Of the skull, nearly the entire right half is preserved as well as portions from the left side including the quadrate region, the posterior half of the cranium roof from the median line to the middle of the orbit and supratemporal vacuity, and fragments of the maxilla along the alveolar margin. Of the base of the skull but little remains save the separate occipital condyle and portions of the exoccipitals.

In general shape and appearance it is quite similar to that of the alligators. A lateral expansion of the maxilla in the region of the third to fifth maxillary teeth produces a marked break in the otherwise regular outline of the muzzle, more prominent, perhaps, than in most of the Crocodilia. The width of the skull in the region of this maxilla expansion is 72 mm. Immediately back

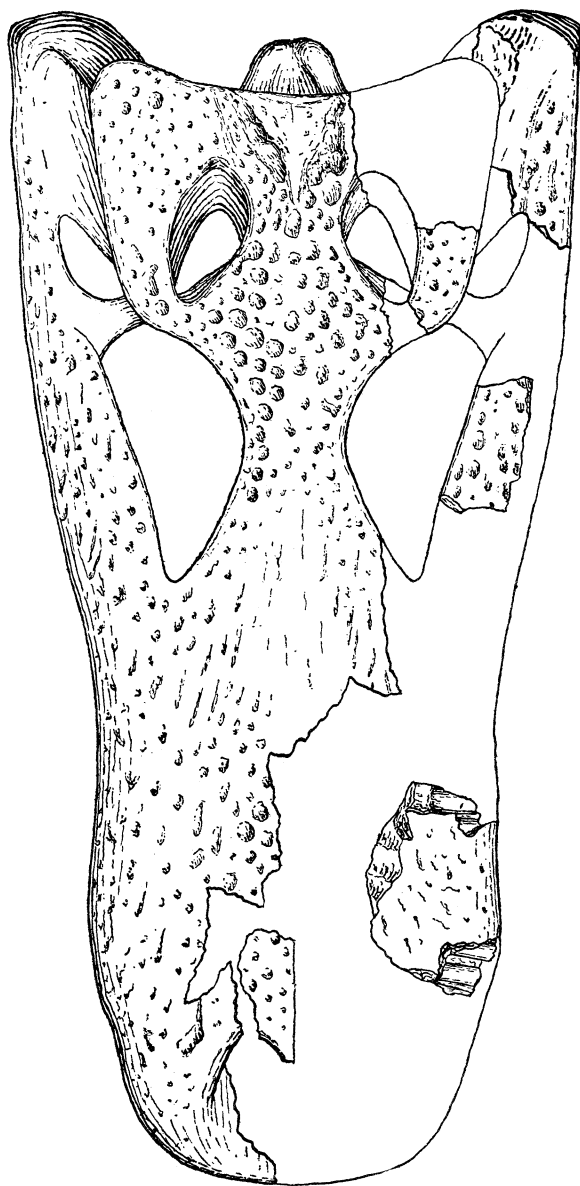


FIG. 1.—*Caimanoideus Visheri*, dorsal view of skull, about three-fourths natural size.

of the expansion, the width is but 66 mm. The greatest width, across the quadrates, is approximately 100 mm. The length of the skull, along the median line from the posterior border of the supraoccipital to the tip, is some 180 mm. From the posterior edge of the quadrates to the tip of the muzzle the measurement is 203 mm. Unlike the most of the Crocodylia, the inter-orbital region is flat, or essentially so, rather than presenting the marked concavity.

All the bones of the facial region of the skull are sculptured by more or less pronounced rounded pits or longitudinal grooves except the posterior ends of the nasals. In the maxillary region, the markings are more or less ill defined and, for the most part, take the form of long and narrow longitudinal grooves. The pits of the posterior frontal region are round, well defined, and deep. They are crowded close together and separated by narrow ridges only. The pits average 2.5 mm. in diameter, perhaps, in this region. On the

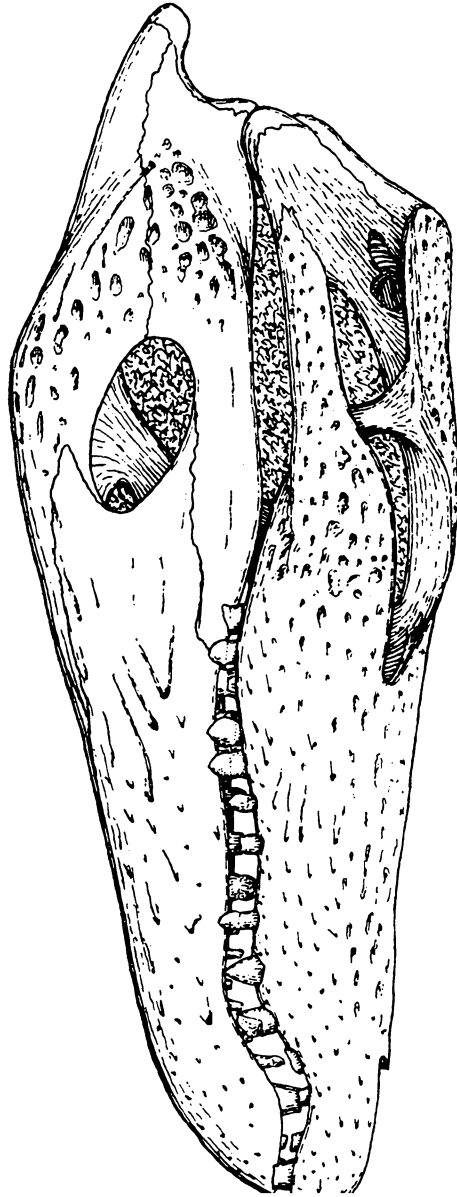


FIG. 2.—*Caimanoideus visheri*, right lateral view of skull and mandible, three-fourths natural size

pits are shallow and varying in size, for the most part minute, but well defined.

The relations of the various bones of the skull are quite alligatoroid, as are their general proportions with few exceptions. The prefrontal is relatively longer than in the genus *Alligator* and extends at least half the length of the lachrymal in advance of the latter element. The nasals are relatively broad, the two making nearly half the total width of that part of the skull.

Unfortunately, part of the anterior border of the snout is missing, but the portions present are sufficient to show some of the important characteristics. Unlike the condition in all the true alligators, the nasals, while projecting slightly into the external narial opening, do not form a more or less complete bony septum. Furthermore, the premaxillae do not form an arch over the anterior border of the opening as is the case in all modern and extinct alligators with one or two exceptions, perhaps. In this respect, the skull simulates that of *Brachychampsa Montana*, an alligatoroid form described by Gilmore from the Upper Cretaceous of Montana.<sup>1</sup> To quote: "In the absence of a roof-like covering formed by the premaxillaries over the anterior part of the external nares, *Brachychampsa* differs from all known alligators, both recent and extinct."

The anterior border of the nares in the described form differs from that of *Brachychampsa*, however, in that the premaxilla in the former are still further reduced till the nares are directed slightly forward and lack entirely the definite ridgelike anterior border. This is the condition pointed out by Loomis in a specimen described by him from the Oligocene of South Dakota and referred to the genus *Crocodylus*.<sup>2</sup> Quoting Loomis on this point: "The undivided nasal opening is very far forward, and differs from that of the other crocodiles in the lack of a distinct anterior border, this portion of the nasal cavity having a smooth, rimless boundary on the premaxilla. The nostril opening would seem, therefore, to have been directed to the front, rather than upward on the snout.

<sup>1</sup> "A New Fossil Alligator from the Hell Creek Beds of Montana," *U.S. Nat. Mus.*, XLI (1914), 299.

<sup>2</sup> "A New River Reptile from the Titanotheres Beds," *Am. Jour. Sci.*, CLXVIII (1914), 429.

(The lack of a rim gives the snout a distinctly mammalian appearance.)”

The teeth are well preserved for the most part and, with few exceptions, have the crowns preserved entire. On the right premaxilla, there are preserved four alveolae. On the portion of the premaxilla broken away, there is apparently space for two additional alveolae, but there is possibly only one. In the latter case, the total number is five, the number in the specimen described by Loomis. Concerning this series but little can be said, as only the circular roots of four remain. Of these the next to the last is the largest, 5.5 mm. in diameter. In each maxilla there are apparently thirteen teeth, a smaller number than is usually found in the alligators. Of these the fourth is much the largest, fully 8 mm. in diameter at the base and approximately circular in section. The posterior maxillary teeth are all more or less laterally compressed. The roots are oval in cross-section and in measurements range from 2.5 mm.  $\times$  4 mm. to 4 mm.  $\times$  7 mm., the more posterior teeth being the larger in general. The crowns of the first four maxillary teeth are somewhat flattened on the inner side and present a slight trenchant anterior and posterior edge. They are sharply conical and very slightly incurved, perhaps. The crowns of the posterior teeth show a rapid transition from this type to those with swollen crowns, rather sharply conical in the first of the series and more blunt or even of a rounded form posteriorly. A brief description of the well-preserved eleventh maxillary tooth will serve well to characterize this type. The crown is subglobular and is flattened somewhat on the upper, inner surface. It is sharply set off from the root by a marked necklike constriction. The apex is marked by an indistinct, antero-posteriorly placed carina that does not extend down on the sides.

Of the posterior part of the skull but little remains except the basi-occipital. The condyle is more or less spout-shaped and is divided into two distinct surfaces by a well-marked median groove.

The palate is almost entirely lacking except for a small portion along the maxilla-premaxilla union. At this point there is a deep, sharply outlined pit for the reception of the fourth mandibular

tooth. The pit does not perforate the facial surface of the bone, however, as is occasionally the case in the alligators.

The lower jaws are represented by an almost perfect right ramus and a goodly portion of the left, including the symphyseal and articular regions. The sculpturing of the mandible is much the same as in any of the alligators; the dentary is marked by small, deep pits and more or less prominent longitudinal grooves. In the region back of and below the external mandibular foramen the surface is dotted with deep rounded pits, irregular in size but distinct. In the relation of the various mandibular elements there is nothing of particular interest except perhaps in the unusual forward extent of the splenial. This element extends far forward and takes an ample part in the symphysis. Each ramus bears nineteen teeth, very similar, in general, to the maxillary teeth. The fourth tooth is the largest in the series, round in section, and measures fully 6 mm. in diameter at the base. The crown is largely missing, but was apparently sharply conical, and the indications are that there was a faint anterior and posterior carina extending down the sides. This was probably the condition of the anterior four teeth in each ramus. The root of the first tooth indicates that it was somewhat larger (about 4 mm. in diameter) than the two subequal teeth that follow.

Immediately following the fourth tooth is a series of seven, all comparatively short and slender and averaging about 2 mm. in diameter at the base and 4.5 mm. in height. These small teeth have slightly swollen crowns and a faint suggestion of anterior and posterior carina. The posterior eight teeth are subequal in size and quite like the eleventh maxillary tooth described above.

The nature of the bite is alligatoroid in that the teeth of the mandible all close within the teeth of the upper jaw and the fourth mandibular tooth fits into a deep socket in the palate surface.

#### THE VERTEBRAL COLUMN

Eight of the cervical vertebrae are present, all but the atlas. With the exception of the axis, they are all very pronounced procoelous. Although the union between the centrum and the arch is clearly distinguishable, the two parts are as a rule closely united.

There is nothing distinctive in this series that serves to set them off from the other Crocodylia save perhaps in the atlas. The odontoid process is very prominent, and in a superficial way resembles the spout-shaped process of some of the mammals. The total length of the series, allowing for the missing atlas, is approximately 18.5 cm. Of the dorsal series all are preserved. As the cervicals, they are of the pronounced procoelous type. The total length of the series is about 23.7 cm. The five lumbar vertebrae are well preserved. The posterior articular faces of the centra are all highly convex and round in outline except the fifth. In this the posterior face of the centrum is fully twice as wide as high. The lumbar together measure 11.7 cm. The two sacra measure 4.7 cm. A noteworthy feature is the shifting of the sacral ribs. The posterior rib forms a small part of the posterior concavity into which the first caudal fits. The anterior rib is shifted forward to such an extent that it might be said to articulate intercentrally, for although it is solidly fused to the first sacral vertebra, nearly half of its diameter extends beyond the anterior face of that vertebra and articulates broadly with the last lumbar. Of the caudal vertebra, there are 23 preserved. There are probably about 11 missing, almost entirely from the posterior end of the series. The vertebrae present measure about 23.7 cm. To this should be added perhaps 16.5 cm. for those missing, making a total of 40.2 cm. for the caudal series.

Of the numerous appendicular bones indiscriminately preserved the femora alone, perhaps, deserve special mention. Both of these bones are nearly complete, but the right is the more nearly perfect (Fig. 3). The head is broad and much flattened. The articular surface extends entirely around the end and on the side of the pronounced rounded cone that rises from the concave lower surface close to the proximal end of the bone. The trochanteric ridge on the flexor surface is very pronounced, more so than usual. At this point, about 45 mm. below the head, the shaft is bent abruptly back and from there sweeps backward in a broad, anteriorly concave curve to the distal end.

The dorsal armor consists of a large number of pitted plates, sub-rectangular in outline for the most part. Of these there are



several distinct types and a great variation in size. All bear a more or less prominent antero-posteriorly directed carina on the dorsal surface and are concave below from side to side to some extent at least and often sharply so. The dorsal surface of all is deeply sculptured by small, rounded, closely crowded pits. While the anterior and posterior edges are smooth, the lateral edges of

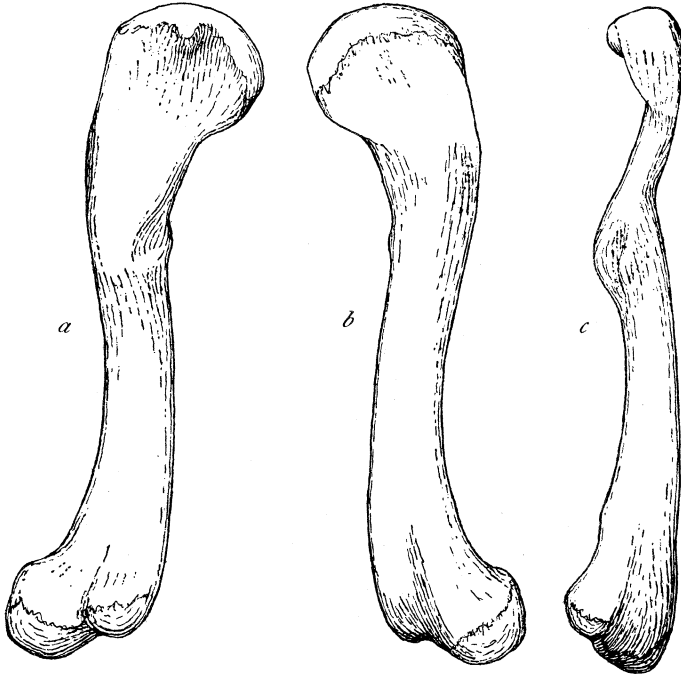


FIG. 3.—*Caimanoideus Visher*, right femur; *a*, from below; *b*, from above; *c*, from behind; three-fourths natural size.

most of them indicate a more or less firm union with an adjacent plate. In some plates, this union is indicated on one margin only, and a few apparently were entirely free. The plates were probably arranged in more or less rigid transverse rows of five units at least, and, in much probability, seven units for certain regions of the back. Fig. 4 indicates the apparent arrangement of the plates.

As pointed out above, the affinities of this form with the genus *Alligator* are marked. This is shown chiefly in that the fourth

mandibular tooth fits into a deep pit in the palate instead of closing in a notch, as in crocodiles. Furthermore, all the mandibular teeth close within those of the upper jaw. In the lack of a division of the anterior nares and the lateral union of the dorsal scutes, the form is quite similar to the genus *Crocodylus*. It apparently stands much nearer to *Caiman*, however, than to either of the genera mentioned above inasmuch as this group combines the alligatoroid bite, the undivided anterior nares, and the lateral union of the dorsal scutes. One of the striking differences from *Caiman* is to be seen in the entire lack of the anterior border of the external narial opening in the form here described. A new genus, *Caimanoeda*, is proposed to include this form *C. Visheri*, which may be considered the type, and *C. (Crocodylus) prenasalis*, Loomis,<sup>1</sup> a form that a careful examination of the type skull has shown to be very similar to *C. Visheri*.

If one may depend on the figures of *C. prenasalis* there is a noticeable difference between the dorsal scutes of this form and those of *C. Visheri*. In the latter, all the scutes are more or less strongly keeled, and are much more finely and regularly pitted than in the former. Greater differences are to be noted in the vertebrae. Of the vertebral column of *C. prenasalis* Loomis says: "The vertebrae are all deeply procoelous. Those of the lumbar region have heads (posterior) which are short, wider than high, and rectangular in outline. Those of the dorsal region, however, are smaller and have prominent conical, rounded heads."

As pointed out above, in the lumbar of *C. Visheri*, the posterior face of the centra are regularly convex and round in outline and the

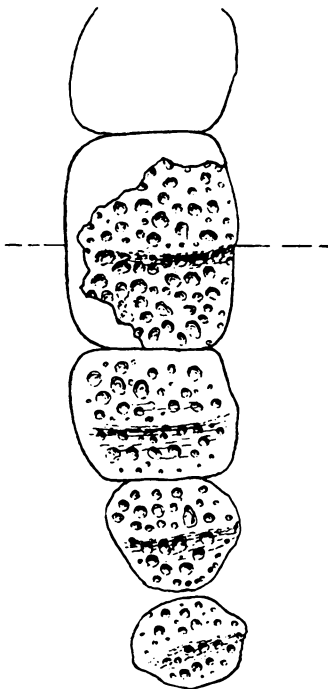


FIG. 4.—*Caimanoidea Visheri*, apparent arrangement of dorsal armor in transverse rows, about three-fourths natural size.

<sup>1</sup> *Op. cit.*

centra differ but little in size from those of the dorsals. The vertebra figured and described as a dorsal of *C. prenasalis* is apparently very similar to the anterior caudals of *C. Visheri* and may well belong to the caudal series. This being the case, the vertebrae of the two forms are not very different.

The remains of *C. Visheri* represent a creature approximately five and a half feet from tip to tip. The skeleton is probably not that of a young individual, but it is possible that it had not reached its greatest length. It is probably a good average for the species, and is apparently somewhat smaller than *C. prenasalis*.

While any record that indicates the former distribution, the relative abundance, and the diversity of the extinct Crocodilia is noteworthy, there is, perhaps, a special interest in the form here described in the light that it throws on the ancestry of the caimans. To the writer's knowledge, there is no record of extinct caimans and the history of the alligators is almost as obscure. While the genus *Caimanoidea* is perhaps too highly specialized in the external narial opening to stand in the direct line of the caimans, in other respects, especially the moderate size of the supratemporal fenestrae, it is very similar to what one would expect in their primitive ancestors. The genus stands close enough to the modern forms to indicate a very ancient history for this group.

The writer wishes to take this opportunity to thank Professor Over, through the courtesy of whom he was permitted to study the material here described, and President C. C. O'Harra of the South Dakota School of Mines for the loan of the type skull of *Caimanoidea (Crocodylus) prenasalis*. The writer is also greatly indebted to Professor Ruthven, director of the zoölogical museum, University of Michigan, for the loan of *caiman* material and for valuable information concerning that group.

The type of *Caimanoidea Visheri* is number 1,044 in the University of South Dakota geological collections.